What is the relationship between the intake of cooked dry beans and peas and body weight?

Conclusion

Limited evidence exists to establish a clear relationship between intake of cooked dry beans and peas and body weight.

Grade: Limited

Overall strength of the available supporting evidence: Strong; Moderate; Limited; Expert Opinion Only; Grade not assignable For additional information regarding how to interpret grades, click here.

Evidence Summary Overview

The few intervention studies on the relationship between intake of cooked dry beans and peas (not including soy) and body weight find mixed results. This conclusion is based on the review of one meta-analysis (Anderson and Major, 2002), one systematic review (Williams, 2008), four trials (Crujeiras, 2007; Pittaway, 2006; Pittaway, 2007; Pittaway, 2008) and one cross-sectional study (Papanikolaou, 2008) for beans and peas. Additionally, the Committee reviewed one systematic review (Cope, 2008) and one cohort study (Maskarinec, 2008) specifically pertaining to soy foods, all published since 2000.

In a meta-analysis of 11 studies, Anderson and Major (2002) found that the intake of non-soy legumes was associated with decreased body weight. In a systematic review examining the role of whole grains and legumes in preventing and managing overweight and obesity, Williams et al (2008) concluded that weight loss is achievable with energy-controlled diets high in legumes but felt there was insufficient evidence to draw conclusions about the protective effect of legumes on weight.

Results from feeding trials with beans and peas are mixed, but diet treatments with beans and peas are generally no more successful in weight loss than the control or comparison treatment. In two randomized crossover trials comparing chickpea-to wheat-supplemented diets, no significant (NS) differences between dietary interventions was observed (Pittaway, 2006; Pittaway, 2007). In a study that included chickpea-supplemented ad libitum, a NS decrease in body weight was observed during the chickpea phase compared to the control phase (Pittaway, 2008). In a randomized controlled trial (RCT) comparing hypocaloric diets high in non-soybean legumes to a diet without legumes, both groups lost weight with greater weight loss achieved by those consuming legumes. A comparison of bean eaters from National Health Examination and Nutrition Surveys (NHANES) 1999 to 2002 suggest that bean consumers had lower body weights and waist circumferences in comparison to non-consumers (Papanikolaou, 2008).

In a systematic review of soy foods and weight loss, Cope et al (2008) concluded that there was limited evidence to support the hypothesis that soy foods increase weight loss when fed at isocaloric levels or that soy foods affect caloric intake when included as part of a diet. In a cohort study, women consuming more soy during adulthood had a lower body mass index (BMI), but the relation was primarily observed for Caucasian and postmenopausal participants (Maskarinec, 2008).

Evidence Summary Paragraphs

Beans and Peas (Not Including Soy)

Systematic Review / Meta-Analysis

Anderson and Major, 2002 (neutral quality), a meta-analysis of 11 international studies, quantitatively analyzed changes in serum lipoprotein levels and body weight resulting from intake of non-soya pulses. Intake of non-soya pulses was associated with decreases in fasting serum cholesterol (-7.2%; 95% CI: -5.8 to -8.6%), low-density lipoprotein (LDL) cholesterol (-6.2%; 95% CI: -2.8 to -9.5%), triacylglycerols (-16.6%; 95% CI: -11.8 to -21.5%) and body weight (-0.9%; 95% CI: 2.2 to -4.1%), as well as an increase in high-density lipoprotein (HDL) cholesterol (2.6%; 95% CI: 6.3 to -1.0%). The authors concluded that the available evidence indicates that regular consumption of pulses may have important protective effects on risk for CVD.

Williams et al, 2008 (positive quality), a systematic review of 53 international studies, assessed the evidence about the role of grains and legumes in the prevention and management of overweight and obesity. Databases searched included PubMed, Medline, Scopus, CINAHL and ScienceDirect, for the period 1980 to 2005. The search terms used were cereal, grain, wholegrain, legume, pulse, bread, pasta, rice, wheat, barley, oat, rye, soy, bean and pea, in conjunction with obesity, overweight, satiety, BMI and waist. The authors concluded that strong evidence supports that a diet high in whole grains is associated with lower BMI, smaller waist circumference and reduced risk of being overweight, and that a diet high in whole grains and legumes can help reduce weight gain. In addition, significant weight loss is achievable with energy-controlled diets that are high in cereals and legumes. Weak evidence supports that high intakes of refined grains may cause small increases in waist circumference in women, and there is insufficient evidence to draw conclusions about the protective effect of legumes on weight. There is no evidence that low- carbohydrate (CHO) diets restricting cereal intakes offer long-term advantages for sustained weight loss. The authors conclude that a diet high in whole grain cereals and legumes will support good overall health and is likely to help maintain a healthy body weight.

Trials

Crujeiras et al, 2007 (neutral quality), an RCT conducted in Spain, evaluated whether a hypocaloric diet high in non-soybean legumes would decrease oxidative stress in obese subjects in addition to the recognized effects associated with weight loss, especially in relation to lipid peroxidation. Thirty obese subjects (17 men and 13 women) with mean age of 36±8 years and mean BMI of 32.0±5.3kg/m^2 were included in the study. The subjects were randomly assigned to one of two energy-restricted (-30% energy with respect to the subject's energy expenditure) dietary treatments for eight weeks: 1) LD, or legume diet, with four days a week non-soybean legumes (lentils, chickpeas, peas and fava beans) servings (N=15); 2) CD, or control diet group, without legume consumption (N=15). The macronutrient content was designed to supply 20% energy from protein, 50% from CHO and 30% from fat, for both diets. Compliance was assessed with three-day weighted food records. Mean caloric intake was 2,479±1,832 kcal per day at baseline, and 1,462±354kcal per day at the end point (P=0.001). There was a significant decrease in body weight in both groups following the energy-restricted diets, with higher weight loss in the LD group as compared to the CD (-7.7±3% vs. -5.3±2.7%; P=0.023). The decrease in body weight correlated with the dietary fiber content (R=0.46; P=0.014).

Pittaway et al, 2006 (positive quality), a randomized crossover trial conducted in Australia, compared the effects of a chickpea-supplemented diet and those of a wheat-supplemented diet on serum lipids and lipoproteins. 52 participants enrolled in the trial, and 47 adults completed the study (mean age = 53.0±9.8 years; mean BMI = 27.6±4.1kg/m^2). The chickpea diet involved daily consumption of 140g of canned, drained chickpeas, chickpea bread and chickpea shortbread biscuits provided by the study personnel. The wheat diet involved consumption of wholemeal (wheat) bread, high- fiber (wheat) breakfast cereals and shortbread biscuits that participants purchased from their usual grocery store. Both interventions were designed to be weight maintenance diets and were at least five weeks in duration. Participants were asked to maintain their usual body weight and patterns ofphysical activity throughout the study period. There were NS differences in body weight and BMI between the start and the end of each dietary period or at the end of the two intervention diets (all P>0.2).

Pittaway et al, 2007 (positive quality), a randomized crossover trial conducted in Australia, compared the effects on serum lipids, glucose tolerance, satiety and bowel function of a diet supplemented with chickpeas to a wheat based diet of similar fiber content, and also the impact of a lower fiber diet on bowel function and satiety. Subjects consumed the two dietary interventions for five weeks each, with a washout period of six to eight weeks between interventions; the additional low-fiber diet study was followed for three weeks only. The chickpea diet was based on consuming 140 g of canned, drained chickpeas daily, plus bread and shortbread biscuits made with 30% chickpea flour. The wheat diet was based on consuming whole wheat bread and high-fiber breakfast cereals daily, while the lower-fiber diet included white bread and lower fiber breakfast cereals. Thirty one subjects (mean age 50.6±10.5 years) were enrolled in the trial, 27 (17 females, 10 males) completed both diet interventions and 18 (11 females, seven males) completed the lower-fiber diet study. Body weight was similar following the chickpea and wheat intervention diets (NS differences).

Pittaway et al, 2008 (positive quality), an ordered crossover trial conducted in Australia, observed the effects of chickpea supplementation on ad libitum nutrient intake, body weight, serum lipids, lipoproteins and other metabolic changes. Subjects consumed normal intake for four weeks, ad libitum diet with at least 104g of chickpeas per day for 12 weeks and normal intake for four weeks. Fifty subjects (mean age 52.2±6.1 years) were enrolled and 45 (13 premenopausal women, 19 postmenopausal women and 13 men) completed the trial. A small, NS decrease in mean body weight was observed during the chickpea compared with the usual phase (0.45kg; 95% CI: -0.87, 0.03kg; P=0.07).

Cross-Sectional Study

Papanikolaou et al, 2008 (positive quality), a cross-sectional study in the US, evaluated the association of consuming beans on nutrient intakes and physiological parameters using data from the NHANES 1999 to 2002. A secondary analysis was completed with a reliable 24-hour dietary recall where three groups of bean consumers were identified: 1) Baked bean (BB); 2) Variety bean (VB); and 3) Variety bean or baked bean (VBBB). No significant differences in body weight, BMI or waist circumference were observed between BB consumers and non-consumers. The VB consumers had lower body weights (77.1±1.2 vs. 80.4±0.3kg, P=0.004), smaller waist circumferences (93.9±1.1 vs. 96.0±0.3cm, P=0.04) and a 29% lower increased waist size risk (OR=0.71; 95% CI: 0.55, 0.91; P=0.009) in comparison to non-consumers. The VBBB consumers had a lower body weight (77.5±1.1 vs. 80.5± 0.3kg, P=0.008) and a smaller waist size (94.2±1.0 vs. 96.1± 0.3cm, P=0.043) relative to non-consumers. Also, adult consumers of VBBB had a 23% reduced risk of increased waist size (OR=0.77; 95% CI: 0.62, 0.95; P=0.018) and a 22% reduced risk of being obese (OR=0.78; 95% CI: 0.64, 0.97; P=0.026) compared to non-consumers. The authors concluded that bean consumers had better overall nutrient intake levels and better body weights and waist circumferences in comparison to non-consumers.

Soy Foods

Systematic Review

Cope et al, 2008 (neutral quality), a systematic review including 91 international references, identified and evaluated evidence regarding four propositions related to soyfoods and weight loss. PubMed and Web of Science were searched using the keywords soy, weight loss, fat loss, cholesterol, cardiovascular, glucose, LDL, HDL, bone, osteoporosis, isoflavone.

- Certain soyfoods will improve weight and fat loss when fed at isocaloric levels: This proposition is supported by animal studies, but there is no compelling support in human studies
- Certain soyfoods will improve weight and fat loss when included as part of a diet by affecting caloric intake: This proposition has limited supportive evidence in animal and human studies
- Certain soyfoods will prevent or improve risk factors related to glucoregulatory function and cardiovascular health during weight loss: This proposition is supported by limited evidence and additional evidence is needed before conclusions can be made
- Certain soyfoods will minimize the loss of bone mass during weight loss: This proposition is not supported by evidence.

Cohort Study

Maskarinec et al, 2008 (neutral quality), a cohort study assessed the relation between lifetime soy consumption and BMI among 1,418 women in Hawaii. Data was from two previous studies: The Breast Estrogen and Nutrition Study (BEAN) (N=225) and the Nested Case-Control Study (NCC) of mammographic densities (N=1,193). Dietary intake was assessed by a 26-page self-administered Diet and Health Questionnaire (DHQ) and a Life-time Soy Questionnaire (LTSQ) at study entry. A second LTSQ was completed at five years. Annual frequency of usual serving sizes for four categories of soy foods were classified into four categories for adults: None, less than one serving a week, more than one servings a week and more than two servings a week. Also, a four-level variable that combined intake during early life and adulthood was created. Results showed a significant trend for the association of adult soy intake withBMI at study entry (P=0.02). Women reporting more than two soy servings per week had a 0.7kg/m^2 lower BMI than women consuming no soy foods. This relation was stronger for the 937 postmenopausal women (1.2kg/m^2; P=0.01), while no trend was seen for the 481 premenopausal women (P=0.76). When analyzed separately by ethnicity, the trend was only significant for Caucasians (P=0.01) with a 2.1kg/m^2 lower BMI in the highest than in the lowest intake group. Early life soy intake was not related to BMI at study entry or at age 21. The overall model with combined adult and child soy intake was significant (P<0.0001). The contrast between low vs. high adult soy intake was significant (P=0.002) with a difference of 0.9kg/m^2 between the low and high adult soy intake categories. This difference was of similar magnitude in pre- and post-menopausal women (P=0.08 and 0.01). After stratification by ethnicity, the effect was only significant for Caucasians (P=0.001) with a 2.35kg/m^2 lower BMI for the high adult soy intake category as compared to the low intake category. The contrast between low and high adulthood soy intake was significant (P=0.02); women in the low soy intake groups had a yearly weight gain of 0.05kg per year greater than those in the high soy intake groups. Again, the contrast was only significant for Caucasian women (P=0.01). In this study, women consuming more soy during adulthood had a lower BMI, but the relation was primarily observed for Caucasian and postmenopausal participants.

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Author, Year, Study Design,	Participants	Study Methodology	Outcomes

Class, Rating			
Anderson JW et al 2002 Study Design: Meta-analysis Class: M Rating:	N=11 international studies in meta-analysis.	Quantitatively analyzed changes in serum lipoprotein levels and body weight resulting from intake of non-soya pulses.	Intake of non-soya pulses was associated with ↓ in fasting serum cholesterol (-7.2%; 95% CI: -5.8 to -8.6%), LDL-C (-6.2%; 95% CI: -2.8 to -9.5%), triacylglycerols (-16.6%; 95% CI: -11.8 to -21.5%) and body weight (-0.9%; 95% CI: 2.2 to -4.1%), as well as an ↑ in HDL-C (2.6%; 95% CI: 6.3 to -1.0%).
Cope MB et al 2008 Study Design: Systematic Review Class: M Rating:	N=91 international references in systematic review.	Identified and evaluated evidence regarding four propositions related to soyfoods and weight loss. Databases searched: PubMed and Web of Science. Keywords: Soy, weight loss, fat loss, cholesterol, cardiovascular, glucose, LDL, HDL, bone, osteoporosis, isoflavone.	Certain soyfoods will improve weight or fat loss when fed at isocaloric levels: This proposition is supported by animal studies, but there is no compelling support in human studies. Certain soyfoods will improve weight and fat loss when included as part of a diet by affecting caloric intake: This proposition has limited supportive evidence in animal and human studies. Certain soyfoods will prevent or improve risk factors related to glucoregulatory function and cardiovascular health during weight loss; this proposition is supported by limited evidence and additional evidence is needed before conclusions can be made. Certain soyfoods will

			minimize the loss of bone mass during weight loss: This proposition is not supported by evidence.
Crujeiras AB, Parra D et al, 2007 Study Design: Randomized Controlled Trial Class: A Rating:	N=30 obese subjects (17 men and 13 women). Mean age: 36±8 years. Mean BMI: 32.0±5.3kg/m^2. Location: Spain.	Intervention: Two energy-restricted (-30% energy with respect to the subject's energy expenditure) dietary treatments for eight weeks: 1) LD diet with four days per week non-soybean legume (lentils, chickpeas, peas and fava beans) servings (N=15); 2) CD, or control diet, without legume consumption (N=15). Macronutrient content: 20% PRO, 50% CHO and 30% fat for both diets. Compliance assessed with three-day weighted food records.	Mean caloric intake (per day) was 2,479±1,832kcal at baseline and 1,462±354kcal at the end point (P=0.001). Significant ↓ in body weight in both groups following the energy-restricted diets, with ↑ weight loss in the LD group, as compared to the CD (-7.7±3% vs. -5.3±2.7%; P=0.023). ↓ in body weight correlated with dietary fiber content (R=0.46; P=0.014).
Maskarinec G, Aylward AG et al, 2008 Study Design: Prospective Cohort Study Class: B Rating:	N=1,418 women from two previous studies: • Breast Estrogen and Nutrition Study (BEAN) (N=225) • Nested Case-Control (NCC) study of mammographic densities (N=1,193). Location: United States.	Dietary intake was assessed by a 26-page self-administered Diet and Health Questionnaire (DHQ) and a Life-time Soy Questionnaire (LTSQ) at study entry. A second LTSQ was completed at five years. Annual frequency of usual serving sizes for four categories of soy foods were classified into four categories for adults: • None	Results showed a significant trend for the association of adult soy intake with BMI at study entry (P=0.02). Women reporting >two soy servings a week had a 0.7kg/m^2 ↓ BMI than women consuming no soy foods. This relation was stronger for the 937 postmenopausal women (1.2kg/m^2; P=0.01), while no trend was seen for the 481 premenopausal women (P=0.76). When analyzed separately by ethnicity, the

		• <one serving a week • >one serving a week • >two servings a week. Also, a four-level variable that combined intake during early life and adulthood was created.	trend was only significant for Caucasians (P=0.01) with a 2.1kg/m ^{2} lower BMI in the highest than in the lowest intake group. Early life soy intake was not related to BMI at study entry or at age 21. The overall model with combined adult and child soy intake was significant (P<0.0001). The contrast between low vs. high adult soy intake was significant (P=0.002) with a difference of 0.9kg/m ^{2} between the ↓ and ↑ adult soy intake categories. This difference was of similar magnitude in pre- and postmenopausal women (P=0.08 and 0.01). After stratification by ethnicity, the effect was only significant for Caucasians (P=0.001) with a 2.35kg/m ^{2} ↓ BMI for the ↑ adult soy intake category, as compared to the ↓ intake category. The contrast between ↓ and ↑ adulthood soy intake was significant (P=0.02); women in the ↓ soy intake groups had a yearly weight gain of 0.05kg per year >those in the ↑ soy intake groups. Again, the contrast was only significant for Caucasian women (P=0.01).

Papanikolaou Y and Fulgoni VL, 2008 Study Design: Cross-Sectional Study Class: D Rating:	N=8,229. Data from the NHANES 1999 to 2000 and NHANES 2001 to 2002. Location: United States.	Bean consumption was defined by 24-hour dietary recall. Three groups of bean consumers were identified: 1) Baked bean (BB) 2) Variety bean (VB) 3) Variety bean and baked bean (VBBB). Risk factors of interest: BP, LDL-X, fasting blood glucose, waist size, HDL-C and BMI.	NS differences in body weight, BMI or waist circumference (WC) were observed between BB consumers and non-consumers. VB consumers had ↓ body weights (77.1±1.2 vs. 80.4 ±0.3kg, P=0.004), smaller WC (93.9±1.1 vs. 96.0±0.3cm, P=0.04) and a 29% ↓ increased waist size risk (OR=0.71; 95% CI: 0.55,0.91; P=0.009) in comparison to non-consumers. VBBB consumers had a lower body weight (77.5±1.1 vs. 80.5± 0.3kg, P=0.008) and a smaller waist size (94.2±1.0 vs. 96.1± 0.3cm, P=0.043) relative to non-consumers. Also, adult consumers of VBBB had a 23% ↓ risk of increased waist size (OR=0.77; 95% CI: 0.62, 0.95; P=0.018) and a 22% ↓ risk of being obese (OR=0.78; 95% CI: 0.64,0.97; P=0.026) compared to non-consumers.
Pittaway et al 2006 Study Design: Randomized, crossover intervention trial	N=52 participants enrolled in the trial. N=47 adults completed the study. Mean age: 53.0 ± 9.8 years.	Two periods of weight maintenance dietary intervention, each at least five weeks in duration: 1) Chickpea-supplemented diet 2) Wheat-supplemented diet.	There were NS differences in body weight and BMI between the start and the end of each dietary period or at the end of the two intervention diets (all P>0.2).

Class: A Rating:	Mean BMI: 27.6±4.1kg/m^2. Location: Australia.	The chickpea diet involved daily consumption of 140g of canned, drained chickpeas, chickpea bread and chickpea shortbread biscuits provided by study personnel. Wheat diet involved consumption of whole meal (wheat) bread, high-fiber (wheat) breakfast cereals and shortbread biscuits that participants purchased from their usual grocery store. Participants asked to maintain their usual body weight and patterns of physical activity during the study.	
Pittaway JK et al 2007 Study Design: Randomized Crossover Trial Class: A Rating:	N=31 subjects (mean age 50.6±10.5 years) enrolled in trial. N=27 (17 females, 10 males) completed both diet interventions N=18 (11 female, seven male) completed the lower fiber diet study. Location: Australia.	Randomized crossover trial comparing the effects on serum lipids, glucose tolerance, satiety and bowel function of a diet supplemented with chickpeas to a wheat-based diet of similar fiber content, and also the impact of a lower-fiber diet on bowel function and satiety. Subjects consumed the two dietary interventions for five weeks each, with a washout period of six to eight weeks between interventions; the	Body weight was similar following the chickpea and wheat intervention diets (NS differences).

		additional low-fiber diet study was followed for three weeks only. The chickpea diet was based on consuming 140g of canned, drained chickpeas daily, plus bread and shortbread biscuits made with 30% chickpea flour. The wheat diet was based on consuming whole wheat bread and high-fiber breakfast cereals daily, while the lower-fiber diet included white bread and lower-fiber breakfast cereals.	
Pittaway JK et al 2008 Study Design: Ordered Crossover Trial Class: C Rating:	N=50 subjects (mean age 52.2±6.1 years) were enrolled. N=45 (13 premenopausal women, 19 postmenopausal women and 13 men) completed the trial. Location: Australia.	Non-randomized crossover trial observing the effects of chickpea supplementation on ad libitum nutrient intake, body weight, serum lipids, lipoproteins and other metabolic changes. Subjects consumed normal intake for four weeks, ad libitum diet with at least 104g of chickpeas per day for 12 weeks and normal intake for four weeks.	Small, NS ↓ in mean body weight was observed during the chickpea compared with the usual phase (0.45kg; 95% CI: -0.87, 0.03kg; P=0.07).
Williams PG et al 2008 Study Design: Systematic Review Class: M Rating:	N=53 international studies.	Systematic review assessing the evidence about the role of grains and legumes in the prevention and management of overweight and obesity. Databases searched: PubMed, Medline,	Strong evidence supports that a diet high in whole grains is associated with ↓ BMI, smaller waist circumference (WC) and ↓ risk of being overweight, and that a diet high in whole grains and legumes can help reduce weight gain. In addition, significant weight

Rating:		Scopus, CINAHL and ScienceDirect, for the period 1980 to 2005. Search terms used: Cereal, grain, whole grain, legume, pulse, bread, pasta, rice, wheat, barley, oat, rye, soy, bean and pea, in conjunction with obesity, overweight, satiety, BMI and waist.	loss is achievable with energy-controlled diets that are ↑ in cereals and legumes. Weak evidence supports that ↑ intakes of refined grains may cause small ↑ in WC in women and there is insufficient evidence to draw conclusions about the protective effect of legumes on weight. No evidence that low-CHO diets restricting cereal intakes offer long-term advantages for sustained weight loss. Authors conclude that a diet ↑ in whole grain cereals and legumes will support good overall health and is likely to help maintain a healthy body weight.

Research Design and Implementation Rating Summary
For a summary of the Research Design and Implementation Rating results, click here.

Worksheets

Anderson JW, Major AW. Pulses and lipaemia, short- and long-term effect: potential in the prevention of cardiovascular disease. *Br J Nutr.* 2002 Dec;88 Suppl 3:S263-71.

Cope MB, Erdman JW Jr, Allison DB. The potential role of soyfoods in weight and adiposity reduction: an evidence-based review. *Obes Rev.* 2008 May;9(3):219-35.

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Maskarinec G, Aylward AG, Erber E, Takata Y, Kolonel LN. Soy intake is related to a lower body mass index in adult women. *Eur J Nutr.* 2008 Apr; 47(3): 138-144. Epub 2008 Apr 22.

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Pittaway JK, Robertson IK, Ball MJ. Chickpeas may influence fatty acid and fiber intake in an ad libitum diet, leading to small improvements in serum lipid profile and glycemic control. *J Am Diet Assoc.* 2008 Jun;108(6):1009-13.

Williams PG, Grafenauer SJ, O'Shea JE. Cereal grains, legumes, and weight management: a comprehensive review of the scientific evidence. *Nutr Rev.* 2008 Apr;66(4):171-82.